

DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted:

Group I, claim(s) 1-12, drawn to a bonding device (an apparatus).

Group II, claim(s) 13-24, drawn to a method of bonding objects.

Group III, claim(s) 25-26, drawn to a bonded article.

2. The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I involves a clean means and a bonding means which are used before the actual bonding steps. Group II involves bonding steps the involves certain temperature, pressure and under certain environment . Group III is a product resulted from the method steps.

3. During a telephone conversation with Randolph Smith on May 23, 2008 a provisional election was made without traverse to prosecute the invention of group I, claims 1-12. Affirmation of this election must be made by applicant in replying to this Office action. Claims 13-26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim

remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

5. The examiner has required restriction between product and process claims.

Where applicant elects claims directed to the product, and the product claims are subsequently found allowable, withdrawn process claims that depend from or otherwise require all the limitations of the allowable product claim will be considered for rejoinder. All claims directed to a nonelected process invention must require all the limitations of an allowable product claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product are found allowable, an otherwise proper restriction requirement between product claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product claim will not be rejoined. See MPEP § 821.04(b). Additionally, in order to retain the right to rejoinder in accordance with the above policy, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product claims. **Failure to do so may result in a loss of the right to rejoinder.** Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

6. Claims 13-26 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention Group II and III, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 5/28/2008.

Specification

7. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
8. The following title is suggested: A DEVICE FOR BONDING A METAL ON A SURFACE OF A SUBSTRATE.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 9, the phrase "Vicker hardness Hv" is considered to be Trademark and render the claim as being indefinite because it is unclear and confusing how this limitation affects the metal bonding portion.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 3729

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Nihei et al (UD 5,767,577).

As applied to claim 1, Nihei et al disclose a device for bonding objects to be bonded each having a metal bonding portion on a surface of a substrate, comprising: cleaning means (in Fig. 2) for exposing the surfaces of the metal bonding portions to a plasma having an energy enough to etch the surfaces of the metal bonding portions the entire surfaces of the metal bonding portions under a reduced pressure; and bonding means (in Fig. 5b-5c) for bonding the metal bonding portions of the objects taken out of the cleaning means to each other in an atmospheric air (see Fig. 2).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 2, 8, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nihei et al. in view of Hogerton et al (US 5,714,252).

As applied to claim 2, Nihei et al as modified by Ramm et al does not teach that the step the bonding means has heating means and bonds the metal bonding portions to each other at a temperature of 180°C or lower.

However, Hogerton et al teach the bonding means has heating means and bonds the metal bonding portions to each other at a temperature of 180°C or lower (col. 7, lines 26-37).

As applied to claim 8, Hogerton et al disclose the bonding means is means for bonding the metal bonding portions to each other at a bonding load of 300 MPa or less (col. 8, lines 10-30).

As applied to claim 11, Hogerton et al disclose at least one metal bonding portion is formed by a plurality of bumps (1A-1C).

As applied to claim 12, Hogerton et al disclose a dispersion of bump height is 4µm or less (col. 8, lines 45-57).

It would have been obvious to one of ordinary skill in the art at this time the invention was made to have modified the method of Nihei et al by bonding with temperature, as taught by Hogerton et al, to positively provide reliable electrical interconnections between the IC and the substrate (col. 3, lines 65-67).

14. Claim 3 as best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Nihei et al. in view of Fjetstad et al (US 5,802,699).

As applied to claim 3, Nihei et al disclose all of the limitations of the claim invention except that the steps of the metal bonding portions to be bonded to each other are both formed from gold.

However, Fjetstad et al the surfaces of the metal bonding portions to be bonded to each other are both formed from gold (col. 20, lines 41-60).

It would have been obvious to one of ordinary skill in the art at this time the invention was made to have modified the method of Nihei et al by including the metal bonding is gold, as taught by Fjetstad et al, to positively provide the connection between the contacts and the bump lead (col. 6, lines 49-50).

15. Claim 4 as best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Nihei et al. in view of Tuckerman (US 4,992,847).

As applied to claim 4, Nihei et al disclose all of the limitations of the claim invention except that the steps of cleaning means comprises an argon plasma irradiating means.

However, Tuckerman teaches the cleaning means comprises an argon plasma irradiating means (col. 5, lines 4-40).

It would have been obvious to one of ordinary skill in the art at this time the invention was made to have modified the method of Nihei et al by including cleaning with argon plasma irradiating, as taught by Tuckerman, to positively provide low inductance, high interconnection density (col. 2, lines 34-35).

16. Claims 5-7 and 9-10 as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Nihei et al. in view of Fuchs et al (US 5,919,561).

As applied to claim 5, Nihei et al disclose all of the limitations of the claim invention except that the steps of bonding means is means for making a dispersion of a gap between the metal bonding portions at the time of bonding to be 4µm or less at maximum.

However, Fuchs et al teach the bonding means is means for making a dispersion of a gap between the metal bonding portions at the time of bonding to be $4\mu\text{m}$ or less at maximum (col. 10, lines 45-48).

As applied to claim 6, Fuchs et al disclose the bonding means is means for making a surface roughness of at least one metal bonding portion after bonding to be 10 nm or less (col. 3, lines 10-15).

As applied to claim 7 and 9, Fuchs et al disclose a surface roughness of at least one metal bonding portion before bonding is made to be 100 nm or less (col. 5, lines 51-53).

As applied to claim 10, Fuchs et al disclose bonding means is means capable of adjusting a parallelism in a bonding area between substrates at the time of bonding the metal bonding portions to each other at $4\mu\text{m}$ or less (col. 8, lines 1-12).

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TAI NGUYEN whose telephone number is (571)272-4567. The examiner can normally be reached on M-F (7:30 A.M - 4:30 P.M).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3729

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. Dexter Tugbang/
Primary Examiner
Art Unit 3729

June 23, 2008
/Tai Van Nguyen/
Examiner, Art Unit 3729